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FIBRE PLANTS.

It is proposed in the following notes to deal briefly with fibres derived from tropical endogenous or monocotyledonous plants which yield what are known in commerce as Sisal Hemp, Manila Hemp, Bowstring Hemp, and Mauritius Hemp. These are used chiefly for rope making and cordage, and are to be distinguished from flax, cotton, and other fibres used purely for textile purposes.

The large and increasing interest taken in fibre plants and the numerous references made to this establishment on the subject render it very desirable to place within reach of cultivators in India and the Colonies a summary of information on the subject.

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The Hemps above enumerated are derived as follows :—

i. Sisal Hemp,

Agave rigida, MILL.

(A. Ixtli, *Karw.*
A. elongata, *Jacobi.*
A. Sisalana, *Perrine.*)

ii. Mauritius Hemp,

Furcræa gigantea, VENT.

iii. Manila Hemp,

Musa textilis, NEES.*

iv. Bowstring Hemp,

Sansevieria zeylanica, WILD.*

The fibres of endogenous plants, the chief of which are enumerated above, are generally white if cleaned without fermentation, but are easily discoloured and also weakened by the decomposition of the mucilaginous and saccharine matter associated with them. Hence it is important that they should be cleaned either by mechanical or chemical processes as soon as possible after they are harvested. The resulting fibre, if of good quality, is white, bright, and glossy, and the individual filaments are straight and free.

Although grouped together here for convenience of treatment, the plants yielding these hemps require severally very different treatment under cultivation, and it is important to bear in mind that they will prove objects for remunerative culture only under certain special circumstances.

For instance, the Agave plants yielding Sisal Hemp flourish in the dry districts of Yucatan, they require little cultural attention, and the fibre is cleaned by means of cheap native labour, which is probably attainable in few Britith Colonies.

Manila Hemp is produced entirely in the Phillipine Islands from a species of wild banana or plantain (*Musa textilis*). It requires rich moist forest land, and while in its native country it is found to be easily cultivated; it has been only moderately successful under cultivation elsewhere. Here again the industry is supported by an abundant and cheap labour supply, which enables the fibre to be cleaned by hand at a cheap rate.

Bowstring Hemp is scarcely an article of commerce at present, although locally it is used for many purposes, as in Ceylon, India, and the East and West Coasts of Africa, where species of Sansevieria are found.

Mauritius Hemp is obtained from *Furcræa gigantea*, known in the island as *Aloës vert*, but elsewhere as the green or fœtid aloe. It is a large unarmed species, native of tropical America, but found in both the East and West Indies and also at St. Helena. At Mauritius it has established itself spontaneously on abandoned sugar estates. It is easy of cultivation, and partakes much of the character and habit of the plants yielding Sisal Hemp. Machinery has been used for preparing Mauritius Hemp, and while good prices ruled the industry was fairly remunerative.

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* These will be discussed in Bulletin No. 4 for April.

V.—SISAL HEMP.

Under this term are included fibres derived from probably more than one species of Agave, and it is probable also that one species of Furcraea is used. According to the locality where the industry is carried on or the port of shipment the fibre produced in Yucatan is called Sisal Hemp, which is the recognised name in the English market; or Jenequen or Henequen Hemp, which would appear to be the term more commonly used in the United States. Pita is another Central American fibre, but whether the produce of an Agave (*A. americana*) or of a Bromeliad (*Karatas Plumieri*) is not quite clear. Probably it is loosely applied to both.*

As regards the species of Agave yielding Sisal Hemp Miller first described *A. rigida* (Dict. Ed. 8, 1768) in the following words: "Long, "narrow, stiff leaves, entire, and terminated by a stiff black spine. "These leaves are seldom more than two feet long, little more than an "inch broad, being of a glaucous colour. The side leaves stand almost "horizontally, but the centre leaves are folded over each other and "enclose the flower-bud."

This may be accepted in a large sense as the representative species of which there are several sub-species and varieties cultivated by the natives of Yucatan from time immemorial.

According to Dr. Engelmann (Trans. Acad. Science, St. Louis, Vol. III., Dec. 1875) a common native species in Yucatan called Chelem by the aboriginal inhabitants is identical with *Agave rigida* of Miller; but a number of varieties, characterised by longer leaves or the absence of spines, have been recognised, to which names more or less distinct are now applied.

Mr. Baker has given a Synopsis of the Genus Agave in the *Gardener's Chronicle* (Vols. VII. and VIII., New Series, 1877). The plants mentioned below are included under the group *Rigidæ*, having the edge of the thin horny leaf without any distinct border, and the teeth (when present) small but distinct and deltoid. He remarks that this is a considerable group of which *A. lurida* and *A. rigida* may be regarded as the types intermediate between the groups *Americanae* and *Aloideae*.

From a study of plants at Kew, Mr. Baker was inclined to look upon *A. Ixtli*, Karw., as the type and *A. rigida*, Mill., *A. elongata*, Jacobi, and *A. Sisalana*, Perrine, as syonyms or varieties. But as in the first place *A. rigida*, Mill., has the priority in point of time, and (if we follow Dr. Engelmann) also represents the old aboriginal fibre plant of Yucatan (the Chelem), it would be better to retain this as the aggregate species and place the others among the varieties which have arisen in course of long cultivation in different parts of the peninsula of Yucatan.

We have then,

A. RIGIDA, *Mill.*

var. 1. *A. Ixtli*, Karw.; *A. ixtlioides*, H.K leaves 1½–2 ft. long, teeth distant.

2. *A. elongata*, Jacobi: leaves 4–5 ft., glaucescent and toothed.

3. *A. Sisalana*, Perrine; leaves 4–6 ft. long, pale green not glaucous, generally without teeth.

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* According to Miller Pita fibre is derived from *Furcræa gigantea*, which would make it identical with Mauritius Hemp. Dr. Perrine on the other hand mentions *Agave Ixtli* "as furnishing a fine fibre called Pita."

Dr. Engelmann in his notes cited above mentions that the original plant of *A. rigida*, was, according to Miller, brought from Vera Cruz, but his own specimens were collected in Yucatan by Dr. Schott. He states that Dr. Perrine, and Dr. Schott independently studied and described in Yucatan this interesting plant, with its different forms and economic uses (Senate Doc. 300, Washington, March 12th, 1838; the latter in the Report of the Agricultural Department at Washington for 1869. According to Dr. Engelmann, "both agree that there is a common "native species in Yucatan, called *Chelem* by the aboriginal inhabitants; "but from time immemorial a number of varieties, all characterised by "much longer leaves, and one also by the absence of marginal spines, "and differing among themselves in the quantity and quality of their "fibre, have been cultivated by the natives of Yucatan, and are a staple- "product of that country to this day, furnishing the well-known Sisal "Hemp. The people know them as *Jenequen* (Schott) or *Henequen* "(Perrine), and distinguish, as Dr. Schott reports, the *Yaxci* (Yashki) "as furnishing the best quality, and the *Sacci* (Sacqui) with the largest "quantity of fibre. *Chucumci*, larger than the last, produces coarser "fibre; *Babci* has fine fibre, but in smaller quantity; *Citamci*, with "small narrow leaves and poor fibre, stands probably nearest to the "wild plant. Dr. Perrine mentions another variety, *Istle*, evidently "the *Ixtli* of Karwinski, as furnishing a fine fibre called *Pita*. "These plants yield a return of leaves when four or five years old, "and may last 50 or 60 years under proper management; the flower- "ing scape is cut off as soon as 4 feet high, when, evidently, auxiliary "branches continue the growth of the plant, which is thus kept so "long alive by being prevented from flowering.

"The trunk of the wild plant of Yucatan, which I refer with little "doubt to Miller's old *A. rigida*, is 1–2 feet high; leaves $1\frac{1}{2}$–2 feet "long, and as many inches wide, contracted above the broader base "and widest about the middle; lateral teeth $\frac{3}{4}$ or even 1 inch apart, "mostly straight, from a broad base 1–2 lines long, rather unequal, "with smaller ones interspersed, dark brown; terminal spine 1 inch "long, $1\frac{3}{4}$ lines in diameter, straight, or often somewhat twisted, terete, "scooped out at base but not channelled, dark red-brown, a dark "corneous margin extending down the leaf-edge for several inches and "bearing the uppermost teeth. Scape 12–15 feet high; flowers pale "yellowish green, $2\frac{1}{4}$–$2\frac{1}{2}$ inches long, perigone 16, tubes 6–7, lobes 9–10 "lines long; stamens inserted about the middle of the tube, 'blood-red "upwards,' 1-inch longer than the perigone; anthers 10–$10\frac{1}{2}$ lines "long; styles at last as long as stamens.

"*A. Ixtli*, which in 1872 flowered in the gardens of the late M. "Thuret at Antibes, is entirely similar, flowers of the same dimensions, "anthers a little larger ($11\frac{1}{2}$ lines long); capsules, which grow with "the bulbs on the same panicle, oval, over 2 inches long, $1\frac{1}{4}$ wide, very "short stipitate; seeds uncommonly large, $4\frac{1}{2}$ lines high, with a ventral "hilum (in many other Agaves I find the hilum more basal, a charac- "ter which may be of some value). I believe this is the first time "that the flowers of the Ixtli have been described; * they identify the "plant with the old *A. rigida*, or at least the above-described Chelem. "*A. Karwinskii*, Zucc., is probably the same thing.

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* This remark made by Dr. Engelmann in 1872 is, however, not quite correct. The *ixtlioides* form (*Agave Ixtli*) were fully described and figured by Sir J. D. Hooker, from a plant which flowered at Kew in 1871. (Bot. Mag. t. 5893.)

"With the name of *longifolia* I designate the variety known as "*Sacci* (Sacqui) and extensively cultivated in Yucatan; it is princi- "pally distinguished by its much longer spiny leaves, 4–5½ feet long, "3–4½ inches wide; flowers very similar to those of the wild plant, "but filaments greenish. *A. fourcroyoides*, Jacobi, Agav. p. 107, pro- "bably belongs here, and *A. elongata*, Jacobi, p. 108, I would also refer "to this form if the description did not expressly mention a channelled "terminal spine.

"*Agave Sisalana* is the name that Dr. Perrine gave to the plant "known to the natives of Yucatan as *Yaxci*, the most valuable of the "fibre-producing Agaves, which was introduced by him into South "Florida some thirty-five or forty years ago, during his efforts to accli- "matize commercially valuable tropical plants in that almost tropical "portion of our territory, efforts which were aided by Congress by a "large grant of land, but which were destroyed, together with his own "life, during the subsequent Indian wars. With this Agave, however, "he has been successful, as it is now fully naturalized, and is quite "abundant at Key West and the adjacent coast. Dr. Parry found it "there in full bloom in February 1871, and gives the following des- "cription of it: trunk short; leaves pale green but not glaucous, 4–6 "feet long and 4–6 inches wide, generally smooth-edged, but here and "there bearing a few unequal, sometimes very stout and sharp teeth; "terminal spine stout, often twisted, purplish-black; scape 20 or 25 "feet high, panicle 8 feet long and half as wide. One of the largest "plants examined had 35 branches in the panicle, the largest (near the "middle) 2 feet long, upper and lower ones shorter. The flowers are "slightly larger than those described, with a shorter, thicker ovary, "stamens inserted a little higher up in the tube. The plants bore no "fruit, but produced an abundance of buds, by which they propagate "themselves and from which this interesting form has been multiplied "in this country and in Europe.

"If this plant is, as is most probable, only a cultivated variety of "*A. rigida*, it is of the greatest importance for the study and the "understanding of the Agaves, indicating, as it does, the extent of "variation which they may undergo. It shows that the size of leaf "and scape, or colour of leaf, are of no great specific value, and also "that the presence or absence of spiny teeth on the margin is not an "unalterable character, not any more than the cartilaginous margin "decurrent from the terminal spine. The presence of a trunk, the "proportions of the leaf (in *A. rigida* and all its varieties the length "equals 12–14 times the width), probably the form of the terminal "spine, the character of the inflorescence, and, above all, the form and "proportions of the flower and its parts, remain constant, and perhaps "also the proliferous character of the inflorescence of some species."

In a Report on fibre plants prepared by the late Director of the Botanical Department, Jamaica, in 1884, it is mentioned that with regard to the value of *Agave rigida* and its allied forms as the sources of the Sisal hemp of commerce, there are two important points deserving attention. The first is the universal increasing demand which exists in all countries for this fibre, and the second is the drought enduring character of the plant and the simple and economical treatment which it requires at the hands of the cultivator.

The fibre of these Agaves under their own name or as Sisal hemp and Henequen is quoted at the present time at 38*l.* per ton, which is a little over 4*d.* per pound.

In Yucatan the Agaves are planted about 9 feet between the plants each way, with intervals of 15 or 18 feet at certain distances for carting out the leaves and young shoots. In regularly planted areas there should be 400 plants to the acre. Plants put out as suckers about $1\frac{1}{2}$ to 2 feet high commence to yield in the fourth or fifth year and they "continue to do so for fifty or sixty years and even longer."

As an example of what the probable returns may be from a Sisal hemp plantation, it is stated by Dr. Perrine that each plant at four or five years old yields on an average 25 leaves per annum, the aggregate weight of which is one "arroba" or 25 pounds. Out of this weight of green leaves there is obtained by hand scraping one pound of clean marketable fibre, which at 38*l.* per ton is worth a little over fourpence per pound.

The annual gross return per acre may therefore be set down at 400 pounds of fibre, which at 4*d.* a pound, gives a gross yield of 6*l.* 13*s.* 4*d.* The actual cost of producing and preparing the fibre would vary according to the circumstances of the locality; but where ordinary facilities exist for the transit and preparation of the leaves, and especially with the aid of simple and effective machinery, the cost should not exceed one penny per pound. Hence the net returns may be set down at about 5*l.* per acre per annum.

The export of Sisal hemp exceeds that of any other article of Mexican growth. The export value of fibres from Yucatan in 1883 reached the large sum of 658,000*l.*

Dr. Schott, in the Report of the Department of Agriculture, United States of America for 1869, remarks that "while other products of "Yucatan agriculture may occasionally have become unprofitable either "in consequence of adverse climatic features to which the peninsula is "subject, or through commercial fluctuations, the Sisal hemp has never "been subject to such drawbacks, a fact attributable to the universal "usefulness of its fibre and the unconquerable vitality of the plant, "which easily survives the effects inherent to the nature of a riverless "rocky desert, and the severe trials of a six months' tropical sun. For "a knowledge of the Sisal hemp plant," continues Dr. Schott, "its "culture and uses, Yucatan is indebted to the Maya Indians, the direct "descendants of those remnants of the Toltecs who, after the fall of "their empire in the valley of Mexico, emigrated to Central America "and Yucatan."

An account of the Sisal hemp industry in Yucatan has lately been published by the Government of Jamaica. This was furnished by Mr. Stoddard, who for a time was practically engaged in the industry. It contains information on some points not hitherto available. According to this writer the plant known locally as Sacqui (probably according to Engelmann, the variety *longifolia,*) is most generally cultivated. This is said to yield the largest quantity of fibre, which is characterised by flexibility, whiteness, strength, and weight. It has been already mentioned that Dr. Schott selected the *Yaxci* as furnishing the best quality, and the Sacci (Sacqui) the largest quantity of fibre. It is, however, generally agreed that the bulk of the fibre exported from Yucatan, and called from the former port of shipment Sisal hemp, is the produce of the Sacqui. The chief port of shipment now is Progresso.

The land which supports the fibre industry in Yucatan is of a gravelly, stony, and in some places of a rocky character. The plants thrive best and yield the largest amount of fibre in comparatively arid districts, only a few feet above the level of the sea. Moist land or rich land is considered unsuitable, for although the plants would grow in

the latter, the quantity of fibre yielded would be comparatively small. For convenience of carriage and general management level land is preferred.

Plantations are established by simply clearing the land of trees and scrub. Stumps are uprooted to give an even surface. Shade is a disadvantage. Plants are generally put out during the rainy season, at 12 feet by 6 feet (equal to 605 to the acre) in holes proportional to their size. All fibrous roots and lower leaves are removed before planting, to facilitate new growth. It is estimated to cost "four shillings and six-"pence per acre to line, dig holes, drop suckers, and plant." A well established plantation has an extensive system of roads all converging on the works, which latter are placed in as central position as possible.

After planting, the chief cultural operations are confined to keeping the fields clear of weeds, and removing suckers which grow around the parent plants. These latter are utilised to extend cultivation by being planted in nurseries, or are thrown away. Their removal is considered necessary to the success of the plantation.

A fibre plantation started with plants about $1\frac{1}{2}$ feet high, begins to yield in about three years after planting. Any appearance of the "pole," or flowering spike, is watched, and when 3 or 4 feet high it is cut out. Otherwise the usefulness of the plants for fibre purposes would cease.

The length of leaves cut for fibre should not be less than 3 feet; their ripeness is judged by the colour and by their position in the rosette. Consequently the outer leaves are always cut first, being the oldest. The harvesting of the leaves, which goes on all the year after once started, is effected in the following manner:—Men armed with suitable knives select ripe leaves, cut them close to the trunk, remove prickles from the edge, and point and make them up into bundles of 50 each. Thirty such bundles is a day's task. These bundles are put out on the edge of the cart road, and are taken up by drays, carrying 1,500 leaves to a load, to the works. Cutters, carters, and machinists are paid so much per 1,000 leaves.

The works are placed near a regular supply of water. The power of the engine and the number of machines required all depend on the size of the plantation. One fibre machine is stated to be required for every hundred acres of plants.

After the fibre has passed through the machine it is placed on a drying stand fully exposed to the sun and thoroughly dried. If it is desired to bleach the fibre to a high degree of whiteness it is left out all night and during the next day and carefully turned. The fibre is made up into bales by means of a screw or hydraulic press; care being taken to keep the fibre straight and prevent "fringes."

Each plant when matured yields 30 to 35 leaves per annum, and the return of hemp is at the rate of 1,000 to 1,200 pounds per acre, or about half a ton per acre per annum. The net return on a fibre plantation in Yucatan is estimated at between 4*l.* or 5*l.* per acre.

Plants received at Kew from Yucatan marked "Sisal Hemp" are now growing in the Succulent House No. 5, and lately an experiment was made to test the quality of the fibre yielded by them.

The fibre was extracted by Mr. W. E. Death's fibre machine, and the following report was received upon it from Messrs. Ide and Christie, fibre brokers, of Mark Lane:—

"We are in receipt of the parcel containing a leaf of *Agave Ixtli* and "sample of hemp made from leaves grown in the gardens. These are "most interesting to us, and we have much pleasure in reporting "favourably on the hemp. The quality and strength are very satis-

" factory, while in respect of colour, lustre, and fineness of fibre your " sample is superior to the average Sisal hemp that comes to this " country. The value of this article is exceptionally high at present, " 27*l.* per ton in London. You will see from the statistics given in " enclosed circular that this material is an important one and is exten- " sively used both in England and America. It enters into competition " with Manila hemp and was regarded as an adulterant of the latter in " rope; but as its price is now nearly as high as that of Manila the " ropemakers have not the same inducements to mix the hemps."

VI.—MAURITIUS HEMP.

A hemp industry was started at the Mauritius to utilize the large number of plants of *Furcræa gigantea*, Vent., which had spontaneously established themselves on low lying lands near the sea coast. This is one of the oldest and best known species of *Furcræa*, and is now universally spread throughout tropical America and also in India, Ceylon, Mauritius, and St. Helena. The trunk below the rosette of leaves reaches a height of 2 to 4 feet. The leaves are 4 to 7 feet long, 4 to 6 inches broad at the middle, unarmed, bright green and channelled down the face. The scape or terminal flowering stem reaches a height of 20 to 30 feet. Like all the other Furcræas this species produces copious oblong bulbillæ in place of or in addition to flowers, which falling take root and reproduce the plant. It has often flowered under cultivation in England; the last time at Kew being the autumn of 1874.

A full account, with description, of the various species of Furcræa is given by Mr. J. G. Baker in *Gardeners' Chronicle* (1879, pp. 623, 624). *Furcræa gigantea* is figured in the Botanical Magazine, t. 2250: Wight Ic., tab. 2025: Decandolle, Plantes Grasses, t. 126.

Although *Furcræa gigantea*, known locally as *Aloës vert*, is the chief fibre plant in Mauritius, there is evidence that *Furcræa cubensis* is also found there as well as species of Agaves such as *A. americana* and others.

Bojer (Hortus Mauritianus, p. 353) mentions the *Aloës vert* (*Furcræa gigantea*) as common in 1837, and states "Croît sur la Montagne " Langue dans les endroits vides et les basilages des habitations dans " tous les quartiers d'île." He does not mention *Furcræa cubensis* at all, so the latter must be a later production. Plants of both species have been received at Kew from the Mauritius Botanic Gardens.

Furcræa gigantea is supposed to have been introduced from South America to Mauritius about 1790. It has evidently found a congenial home there, for without any effort on the part of man it has covered waste lands and abandoned sugar estates to such an extent as to lay the foundation of a considerable fibre industry. The leaves are often 8 feet in length and from 6 to 7 inches in breadth. The pulp of the leaves when crushed gives off a strong pungent odour, and hence this species is sometimes called the *foetid aloe*. The juice is strongly corrosive and soon acts upon wrought iron; it is said to produce less effect on cast iron, while it is practically inoperative on brass and copper.

The plant grows in all soils and up to an elevation of 1,800 feet above the level of the sea. It has, however, more generally disseminated itself on the lowlands near the coast, and on a few of the abandoned sugar estates that have become too dry for cane cultivation.

A fibre industry was started at Mauritius about 12 years ago when the wet or retting system was tried. The cut leaves were first passed through the rollers of a sugar mill and steeped in water for some days. The fibre was then washed and beaten out by hand in running water.

This process was soon found unsuitable as the fibre was discoloured and rendered weak; consequently it obtained comparatively low prices. Attention was then directed to extraction by means of *gratteuse* or scotching machines. Many machines have since been tried, and it is believed that the purely mechanical difficulties connected with cleaning the fibre have been for the most part overcome. The amount of fibre obtained from leaves of the *Aloës vert* was at the rate of 3 per cent. by weight of green leaves. The yield of fibre was at the rate of about 1½ tons per acre. A set of six machines driven by a steam engine of 8-horse power (nominal) cleaned 1,155 pounds of fibre per day, which is at the rate of 197 pounds for each machine per day.

At one time there were eight fibre or hemp companies formed with a total capital of Rs. 1,182,500. The total quantity of fibre exported in 1872 was 214 tons, of the value of 4,934*l.*, which would be at the rate of 21*l.*, 13*s.* per ton. In 1880 it had increased to 662 tons, which sold in England at 28*l.* to 32*l.* per ton. Some samples in 1882 sold as high as 38*l.* per ton. Since that time low prices have ruled, and this added to the fact that the cost of production was considerably increased tended to discourage the industry. It is evident the industry was first started to work off the leaves of self-grown plants which were ready at hand in great abundance. When these leaves were exhausted it remained either to wait until the plants were regrown or to procure supplies of leaves at increased cost from the surrounding country. This latter course being adopted at a time when the market value of fibre was low rendered the enterprise unremunerative. In the returns of 1885 we find that Mauritius hemp imported to this country amounted to 255 tons of the value of 39*l.* per ton. In Messrs. Ide and Christie's monthly circular, Dec. 1886, Mauritius hemp is quoted "in good demand" at 28*l.* per ton.

The following extracts taken from Mr. Horne's Report on the Agricultural Resources of Mauritius will sufficiently explain the circumstances under which the fibre industry was started and the causes which have operated to produce the present depression, which in the interest of the island it is hoped will be only of a temporary character :—

"The industry of extracting fibres from the leaves of the *Aloës vert* is "by no means exhausted. There is ground for believing that it has "yet a future in Mauritius. The fall in the price of this fibre in the "European markets broke several local companies that were formed "for the working of the aloe estates. There was far too much money "invested in them for them to pay."

* * * * *

"On many of the estates self-sown plants abounded in great numbers. "It was from the leaves of these that the companies made money and "paid large dividends when the price of the fibre was good. The "plants had grown naturally on the land, and their presence on it had "not cost a cent. In such cases results materially differ from those of "reaping the crops of regularly laid out plantations with low prices for "the produce. The soil and climate of the localities referred to favour "the growth of the plants in such a degree that little expense need be "incurred in introducing it to new grounds. The plant produces "plantlets in great abundance in this colony. These plantlets grow "viviparously on the parent plant, and adhere to it till they have "developed into almost perfectly formed plants. When the young "plantlets drop from their parent they are perfectly fitted to stand by "themselves. Excepting the want of roots they are perfect. The "roots are emitted as soon as the plantlets come in contact with the "moist soil, even when they are lying on the surface of the ground. "It seems, therefore, that to increase this plant rapidly and cheaply "over a given area, due advantage should be taken of its peculiarities

" and the facilities which it naturally affords for propagation and " increase."

At St. Helena *Furcræa gigantea* has been for some time under cultivation as an introduced plant. Experiments on a small scale have been carried on, and samples of fibre have appeared in the English market. (Report on Resources of the Island of St. Helena, Colonial Office, African No. 275, 1884.)

Messrs. Collyer and Co. reported in 1883 on fibre from St. Helena as follows:—

"Aloe fibre (*Furcræa gigantea*) St. Helena. Good length, full " strength, rather dull colour, generally well cleaned but with some " runners untouched and barky. Value 28*l.* to 30*l.* per ton. This " sample is very different in appearance from the *Furcræa gigantea* " of Mauritius, owing probably to differences of both growth and treat- " ment."

While on the subject of fibre from *Furcræa gigantea* it may not be inappropriate to say a few words as regards the merits of another species, *Furcræa cubensis*. This, as already pointed out, is possibly one of the plants under the name of *Cajun* from which some of the Yucatan fibre is obtained.

It differs from *F. gigantea* in that it has no distinct trunk, or a very short one, below the rosette of leaves. The latter are 3 to 5 ft. long, about 5 inches broad at the middle, bright green, rigid in texture, and armed with regular, hooked, brown prickles.

It is a native of tropical America and cultivated in most tropical countries. A variety of this plant—*F. cubensis*, var. *inermis*—is figured and described in Bot. Mag., t. 6543.

In addition to flowers it produces bulbils on the flowering scape, from which the plant is readily increased. The plant is common in Jamaica, and it is said that there "would be no difficulty in establishing there a large area under cultivation." The fibre is white, strong, and bright looking. It yields at the rate of 2·05 to 3·15 per cent. by weight of green leaf. From experiments carried on at Jamaica under a committee appointed by Government it was found that leaves of *Furcræa cubensis* weighing 366½ pounds yielded 28 pounds of green fibre, which when perfectly dry weighed 7½ pounds. This was at the rate of 2·05 per cent. by weight of green leaf. In the report of the Committee this plant and its fibre are described as follows:—

" Silk grass (*Furcræa cubensis*). Leaves 5 to 6 feet long, generally " armed with strong prickles, but sometimes unarmed or with few " prickles. Common in Jamaica and might be largely propagated at " once. Value of fibre—(*a.*) 28*l.*, good quality, but might be whiter; " (*b.*) fairly clean, fair colour, value about 28*l.* per ton; (*c.*) superior " to Sisal and worth 27*l.* per ton. A good fibre, not quite sufficiently " white in the centre."

The above plants constitute the chief species of Agave and Furcræa yielding commercial fibres.

It may be mentioned here that many Agaves yield fibre, but the fibre may, as in the case of the Jamaica Keratto, prove unsuitable for industrial purposes. The Brokers' Report on Keratto fibre was—"little " strength: not an even (but a curly) fibre: towy: value 12*l.* to 14*l.* " per ton."

Plants yielding true Sisal Hemp might be obtained from Yucatan in large quantities.

D. M.